Claims

[c1] 1. A limited-play optical medium, comprising a plurality of layers, including in sequence:

(a) a first substrate layer;

(b) a data layer;

(c) a reflective layer;

(d) a reactive layer comprising a dye having a reduced state and an oxidized state and further comprising an oxidized form of a reducing agent, said reducing agent being effective to convert the dye from the oxidized state to the reduced state, and

(e) a second substrate layer,

wherein the dye in the reduced state is substantially transparent to light of wavelengths used to read the optical medium, and wherein the dye in the oxidized state absorbs light of wavelengths used to read the optical medium; and wherein the reflective layer is formed from a metal or metal alloy which is not significantly oxidized by the oxidized form of the reducing agent.

[c2] 2. The optical medium of claim 1, wherein the dye in reduced form is leuco methylene blue.

[c3] 3. The optical medium of claim 2, wherein the reducing agent is tin (II) 2-ethylhexanoate.

[c4] 4. The optical medium of claim 3, wherein the reflective metal layer is formed from gold.

[c5] 5. The optical medium of claim 3, wherein the reflective metal layer is formed from silver.

[c6] 6. The optical medium of claim 1, wherein the reducing agent is tin (II) 2-ethylhexanoate.

[c7] 7. The optical medium of claim 6, wherein the reflective metal layer is formed from gold.

[c8] 8. The optical medium of claim 6, wherein the reflective metal layer is formed

from silver.

[c9] 9. The optical medium of claim 1, wherein the reflective metal layer is formed from gold.

[c10] 10. The optical medium of claim 1, wherein the reflective metal layer is formed from silver.

[c11] 11. The optical medium of claim 1, wherein the first and second substrate comprise polycarbonate.

[c12] 12. The optical medium of claim 11, wherein the dye in reduced form is leuco methylene blue.

[c13] 13. The optical medium of claim 12, wherein the reducing agent is tin (II) 2-ethylhexanoate.

[c14] 14. The optical medium of claim 13, wherein the reflective metal layer is formed from gold.

[c15] 15. The optical medium of claim 13, wherein the reflective metal layer is formed from silver.

[c16] 16. The optical medium of claim 1, wherein the reactive layer comprises an adhesive.

[c17] 17. The optical medium of claim 16, wherein the dye in reduced form is leuco methylene blue.

[c18] 18. The optical medium of claim 17, wherein the reducing agent is tin (II) 2-ethylhexanoate.

[c19] 19. The optical medium of claim 18, wherein the reflective metal layer is formed from gold.

[c20] 20. The optical medium of claim 19, wherein the reflective metal layer is formed from silver.

[c21] 21. The optical medium of claim 16, wherein the reactive layer comprises two

sublayers: a reactive coating containing the dye, and an adhesive layer.

[c22] 22. The optical medium of claim 1, wherein the reflective layer comprises a metal or metal alloy having a redox potential that is different from the redox potential of the oxidized form of the reducing agent employed by at least 0.35 V.

[c23] 23. The optical medium of claim 22, wherein the dye in reduced form is leuco methylene blue.

[c24] 24. The optical medium of claim 23, wherein the reducing agent is tin (II) 2-ethylhexanoate.

[c25] 25. The optical medium of claim 24, wherein the reflective metal layer is formed from gold.

[c26] 26. The optical medium of claim 24, wherein the reflective metal layer is formed from silver.

[c27] 27. The optical medium of claim 1, wherein the reflective alloy comprises a metal or metal alloy M, and wherein the redox potential for the reaction $M^{+n} + n e^{-} \rightarrow M^{0}$ is at least 0.5 V.

[c28] 28. The optical medium of claim 27, wherein the dye in reduced form is leuco methylene blue.

[c29] 29. The optical medium of claim 28, wherein the reducing agent is tin (II) 2-ethylhexanoate.

[c30] 30. The optical medium of claim 29, wherein the reflective metal layer is formed from gold.

[c31] 31. The optical medium of claim 29, wherein the reflective metal layer is formed from silver.

[c32] 32. The optical medium of claim 1, wherein the reflectvie metal layer has an initial reflectivity of at least 70%.

[c33] 33. The optical medium of claim 32, wherein the reflective metal layer is formed

from gold.

[c34] 34. The optical medium of claim 32, wherein the reflective metal layer is formed from silver.

[c35] 35. A method for increasing the shelf life of a limited play optical medium, wherein the optical medium comprises a reflective layer formed from a metal or metal alloy, and a reactive layer comprising a dye having a reduced state and an oxidized state and further comprising an oxidized form of a reducing agent effective to convert the dye from the oxidized state to the reduced state, said method comprising the step of selecting the metal or metal alloy from among metals and metal alloys that are not significantly oxidized by the oxidized form of the reducing agent.

[c36] 36. The method of claim 35, wherein the metal or metal alloy is selected from among metals and metal alloys having a redox potential that is different from the redox potential of the oxidized form of the reducing agent employed by at least 0.35 V.

[c37] 37. The method of claim 35, wherein the metal or metal alloy is selected from among metals and metal alloys M having a redox potential for the reaction $M + n e^{-} \rightarrow M^{0}$ of at least 0.5 V.

[c38] 38. A method for increasing the play time of a limited play optical medium, comprising the step of preparing a limited-play optical medium comprising a reflective layer formed from a metal or metal alloy, wherein the initial percent reflectivity from the reflective layer is about 70% or greater.

[c39] 39. The method of claim 38, wherein the initial percent reflectivity is about 75% or greater.